भारतीय मानक **IS 18224 : 2023**

Indian Standard

वेल्डिंग निरीक्षण कर्मियों की योग्यता और प्रमाणन के लिए सामान्य मानक

General Standard for Qualification and Certification of Welding Inspection Personnel

ICS 25.160.10; 19.100

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May 2023 **Price Group 9**

Welding General and its Applications Sectional Committee, MTD 11

FOREWORD

This Indian standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Welding General and its Applications Sectional Committee had been approved by the Metallurgical Engineering Division Council.

The effectiveness of any inspection depends upon the capabilities of the persons who are responsible for, and perform the inspection. This specification has been developed to providea means for evaluating and documenting the competence of the personnel whose duties require adequate theoretical and practical knowledge of welding, applicable codes and standards, the NDT tests they witness, monitor or evaluate.

Most of the fabrication and inspection codes insist that only qualified and certified personnel are employed to carry out mandatory welding inspection jobs at various levels. Therefore, it isthe responsibility of the manufacturer and/or the employer to properly train and certify his welding inspection personnel.

This standard defines the requirements and program for the National Certifying Body to certify welding inspectors. The certification of welding inspectors requires documentation of experience, satisfactory completion of an examination, and proof of visual acuity. The examination tests the inspector’s knowledge of welding processes, welding procedures, non- destructive examinations, destructive tests, terms, definitions, symbols, reports, welding metallurgy, related mathematics, safety, quality assurance, and responsibilities.

In drafting the specification, assistance has been derived from the following:

IS 13085 : 2004 General standard for Qualification and Certification of Non-Destructive Testing Personnel — Specification

ISO 9712 : 1999 Non-destructive testing — Qualification and certification of NDT personnel

AWS QC1 : 2016 Specification for AWS Certification of Welding Inspectors

AWS B5.1 : 2013 Specification for the Qualification of Welding Inspectors

The composition of the committee responsible for the formulation of this standard is listed in Annex E.

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GENERAL STANDARD FOR QUALIFICATION AND CERTIFICATION OF WELDING INSPECTION PERSONNEL

1 SCOPE

This standard establishes a system for the qualification and certification of personnel to perform industrial welding inspection.

2 REFERENCES

The standards given in Annex D contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex D.

3 TERMINOLOGY AND ABBREVIATION

3.1 For the purpose of this standard, the following definition shall apply:

3.1.1 *Authorization* — A permission to work issued by the employer or responsible agency based on the individual’s suitability for a specific job, in addition to the certification, amongstother’s the job specific knowledge, skill and physical ability could be assessed.

3.1.2 *Authorized Qualifying Body* — Competent organization, independent of the employer or responsible agency, approved by the certification body to prepare and administer welding inspection training to qualify welding inspection personnel.

3.1.3 *Basic Education* — Minimum formal academic education required for qualification. It may be used to determine duration and level of training and experience required to be eligible for certification in welding inspection.

3.1.4 *Candidate* — The individual seeking certification in accordance with this standard.

3.1 5 *Certification* — The procedures leading to a written testimony of the qualification of an individual’s level of competence to perform the tasks associated with welding inspection.

3.1.6 *Certificate* — Written testimony of qualification by authorized qualification body as per the provisions of this standard.

3.1.7 *Employer or Responsible Agency* — The organization for which the candidate works on a regular basis. Candidate may be self-employed.

3.1.8 *Examination Center* — Center approved by the national certifying body, either directly or through the authorized qualifying body, where qualification examination will be carried out.

3.1.9 *Examiner* — A person qualified and authorized by the certification body is to conduct and grade welding inspection qualification examinations.

NOTE — No person shall be the examiner for any candidate he has personally trained for that examination.

3.1.10 *Experience* — The period during which the candidate performed the welding fabrication/ inspection as his main activity under qualified supervision including personal application of different inspection techniques to materials, parts or structures. It does not include practical performed during training courses.

3.1.11 *National Certifying Body* — The agency that administers procedures for certification of welding inspection personnel according to the requirements of this standard conducts exams and issues certificate to successful inspectors.

3.1.12 *Welding Inspection Training* — A process of instruction in theory and practice of welding inspection commensurate to the level in which the certification is being sought. This may take the form of training courses to an approved syllabus and periods of practical work under qualified supervision.

3.1.13 *Operating Authorization* — Permission to work, issued by the employer or responsible agency and based on the individual's suitability for a specific job.

3.1.14 *Qualifying Examination* — An examination administered by the national certifying body to assess the knowledge and competence of the candidate. Examination includes a written and a practical part commensurate to the levels along with a viva voce. The candidate should be able to demonstrate appropriate level of knowledge and skill in welding inspection. Details of the theoretical and practical knowledge and competency requirements along with examination procedure and requirements for each of the three levels are given in Annex A.

3.1.15 *Qualification* — A set of pre-defined academic achievements from a recognized institution which is pre-requisite to apply for welding inspector certificate and essential to perform welding inspection tasks. The scale of achievements required varies with the level of certification sought.

3.1.16 *Significant Interruption* — Absence or a change of activity which prevents the certified individual from practicing the duties corresponding to his level for a continuous periodexceeding one year.

3.1.17 *Supervision* — Act of directing the welding inspection activities performed by other welding inspection personnel which include and control all operations pertaining to welding inspection.

3.1.18 *Test Specimen* — Specimen used in practical examinations.

3.2 Abbreviation

For the purpose of this standard, the abbreviation having the meaning indicated against each isgiven in Annex C, other abbreviation used in this standard have been fully expressed at its first occurrence.

4 LEVELS OF COMPETENCE

4.1 Classification

An individual certified in accordance with this standard shall be classified in one of the three levels depending upon his respective level of competence. One who has not yet attained certification may be registered as a trainee:

a) Basic level (NWIC — Basic) — Code: CWIB;
b) Standard level (NWIC — Standard) — Code: CWIS; and
c) Advanced level (NWIC — Advanced) — Code: CWIA.

4.2 Required Competence

The candidate should be able to demonstrate appropriate level of knowledge and skill in welding inspection covering the following:

a) Codes and standards;
b) Raw material, control and traceability;
c) Knowledge of materials and their behaviour during welding;
d) Conventional welding and cutting processes and equipment;
e) Safety practices during welding and cutting;
f) Conventional DT and NDT methods including integrity testing;
g) Joint types, welding positions and welding symbols;
h) Welding qualification — procedure and performance;
j) Detection and interpretation of discontinuities through VT and PT;
k) Interpretation and evaluation of RT and UT reports;
m) Comment on and review the quality control documents namely, QAPs, WPSs, PQRs,WPQs, MTCs, DT and NDT reports;
n) Carry out inspection of welded fabrications before, during and after welding including dimensional inspection PMI and PWHT as per the requirements of relevant standards; and
p) Communicate effectively orally and written and prepare reports.

Details of the theoretical and practical knowledge and competency requirements along with examination procedure and requirements for each of the three levels are given in Annex A and Annex B respectively.

5 FUNCTIONS

5.1 Basic Level (NWIC — Basic)

The candidate should be able to independently carry out before, during and post-weld visual inspection and dimensional checks of weldments against specification requirements and drawings.

The person should also be able to carry out the following functions under the supervision of a welding inspector — standard level or welding inspector — advanced level.

a) Understand the application of various standards, codes, specifications, welding symbols, drawings, WPS and statutory/regulatory requirements;
b) Verify the compliance of raw materials and consumables, certificates against the applicable standards, codes and specifications;
c) Verify that joint dimensions, edge preparation, fit up, welding equipment and weld preparations are in accordance with the drawings, standards and process requirements;
d) Verify the compliance of pre-heat procedures against the applicable standards;
e) To carry out in-process surveillance during welding to verify compliance with specified procedure including pre-heat, welding parameters, inter-pass temperature control and any post-heat requirements; and
f) Understand and ensure compliance of applicable safety requirements.

5.2 Standard level (NWICS — Standard)

The candidate should be able to supervise activities of welding inspectors — basic level as given in **5.1**. Besides, he should be able to independently carry out the following functions:

a) All functions carried out by a welding inspector — basic level as given in **5.1**;

b) Develop, comment and review quality control plans and inspection and testing plans based on product standards, codes, specifications, drawings and statutory/regulatory requirements;

c) Review welding procedures (WPS) for compliance with code and contract requirements and verify welding procedure qualification (WPQR) compliance;

d) Witness procedure qualification test including testing of specimen and verify compliance with WPQRs, WPSs and welders qualification against applicable standards for conventional welding processes. (For example, arc welding processes, steels, aluminium alloys etc);

e) Verify the compliance of PWHT procedures against the applicable standards;

f) Verify NDT procedure compliance;

g) Take decisions on acceptance of quality documents related to welded fabrication (for example, NDT, material testing, production testing, etc);

h) Take decisions based on quality documents (For example, NDT, material testing,production testing, etc) according to the requirements defined for the construction;

j) Implement weld inspection quality assurance plans;

k) Evaluation and acceptance of welded fabrication on the basis of DT and NDT testreports;

m) Conduct surveillance and audit of suppliers and vendors;

n) Report on all the above actions; and

p) Training and evaluation of welding inspectors — basic level.

5.3 Advanced level (NWIC — Advanced)

Supervise the activities of welding inspectors — basic as given in **5.1**. Besides, he should be able to independently carry out the following functions:

a) All functions carried out by a welding inspector — Basic and standard level as given in **5.1** and **5.2** respectively;

b) Verify base material and filler material compatibility;

c) Witness procedure qualification test including testing of specimen and verify compliance with WPQRs, WPSs;

d) Conduct welders' qualification tests and qualify the same against applicable standards for conventional welding processes. (For example, arc welding processes, steels, aluminium alloys, etc);

e) Write welding procedures specifications and welder performance qualification;

f) Prepare visual inspection, NDT and destructive testing requirements;

g) Identification of weld defects and determination of their acceptability including radiographic film interpretation for carbon, low alloy and stainless steels;

h) Final acceptance and certification that all requirements specified for the weldment have been met;

j) Prepare welding inspection quality assurance plans, audit and surveillance plans alongwith documentation and control requirements;

k) Maintenance of comprehensive inspection reports;

m) Training and evaluation of welding inspectors — Standard level; and

n) Provide technical leadership and guidance to team of welding inspectors.

6 REQUIRED CODE OF CONDUCT

6.1 Considering the importance of quality of welded fabrication and also the consequences of its failure to individual life and society, the candidate should act with complete integrity and in a professional manner in welding inspection and acceptance of the final product.

6.2 Undertake and perform welding inspection assignments only when qualified/certified to do so.

6.3 The candidate should behave in a professional and disciplined manner which will not affect the safety and security of his fellow members associated in the manufacturing of the final product.

6.4 The candidates behaviour towards his/her superiors, peers and sub-ordinates should be in line with protocol of organization.

6.5 The candidates shall avoid any conflict of interest with the employer or the client and shall not disclose any business association or circumstance that might be so considered.

7 GENERAL PRINCIPLES OF CERTIFICATION

7.1 Administration

The certification activity that includes all procedures adopted to demonstrate the qualification of an individual to carry out tasks in a specific level of welding inspection and leads to a written testimony of his competence shall be administered by the national certifying body with the assistance, where necessary, of duly authorized qualifying bodies.

7.2 National Certifying Body (NCB)

The national certifying body shall be a professional body having suitable competence in the area of welding inspection and accredited by national accreditation board for certifying bodies of QCI in compliance to IS/ISO/IEC 17024 as a certification body for personnel.

7.2.1 *Composition*

The national certifying body shall include eminent representatives from academic institutes, research center, industries, government nodal ministries, public sector undertakings, private sector, other related societies or institutes, insurance bodies, third party inspection agencies including classification societies as appropriate. The NCB shall establish in writing the number of members in the body and their tenure. The body shall submit its report at least once in a year to the body forming authority.

7.2.2 *Responsibilities*

The national certifying body shall execute the following responsibilities:

a) Shall initiate, maintain and promote the national certification scheme according to this standard;

b) Shall administer the procedures and operation for certification in accordance with the documents;

c) Shall prescribe an obligatory code of ethics including options which shall apply to committee members and certificate holders;

d) May delegate, under its direct responsibility, the detailed administration of the certification procedure to other organizations which will act as qualifying bodies and which could represent industrial sectors;

e) Shall take the ultimate responsibility for the certification scheme including technical and administrative requirement;

f) Shall approve properly staffed and equipped examination centers, which it shall monitor on a periodic basis;

g) Shall keep all appropriate records and issue or delegate the issuing of the written testimonies;

h) Shall identify the examiners to start the scheme;

j) Shall approve training agencies in welding inspection techniques;

k) Shall prepare an updated question bank for examinations and also maintain the set of practical examination kits;

m) Shall conduct examination, issue certificate to successful candidates and renew/recertify candidates as appropriate; and

n) Shall develop and maintain a quality manual which shall outline the quality policy and objectives of NCB and also detail/document the procedure methodology including implementation.

7.3 Employer or Responsible Agency

Employer or responsible agency shall introduce the candidate to the national certifying body and document the validity of the personal information provided including the declaration of education, training and experience used to establish eligibility of the candidate, but shall not be directly involved in the certification procedure itself. The employer or responsible agency shall be fully responsible for all that concerns the authorization to operate and the validity of the welding inspection certificate. The employer shall also ensure that the annual vision acuity requirements of **8.3** are met and verify the continuity in welding inspection without significant interruption.

NOTE — If the individual is self-employed, he shall assume all responsibilities described for the employer or responsible agency, and shall be required to provide additional documentation to support claims for experience and training.

7.4 Examination Centers

7.4.1 Examination centers approved by the national certifying body shall have following minimum requirements.

a) Have adequate qualified staff, premises and equipment as decided by national certifying body to ensure satisfactory qualification examinations for the levels;

b) Use only those documents and examination questionnaires established or approved by the national certifying body; and

c) Use only specimens prepared or approved by the national certifying body for the practical examinations conducted at that center. Apply a documented quality procedure outlined in quality manual.

NOTE — When more than one authorized examination center exists, each should have specimens containing comparable defects, duly approved by NCB. The examination specimens shall not be used for training purpose under any circumstances.

7.4.2 An examination center can be situated at employer's premises. In this case, examinations shall be conducted only in the presence of and under the control of an authorized representative of the certification body.

7.5 Authorized Examiner

The examiner shall be authorized by the national certifying body to conduct the qualifying examination and grade the examinee. The examiner shall be technically qualified and knowledgeable as detailed below to carry out the functions.

7.5.1 *Qualifications and Experience*

7.5.1.1 *Essential*

a) Degree/Diploma/Licentiate in mechanical/electrical/metallurgy/chemical /welding technology/AMIIW (Associate Member of Indian Institute of Welding); and

b) Minimum 10 years of experience in welding inspection field in a fabrication industry of inspection agency.

or

International welding engineer-qualification with 8 years' experience in the field of welding.

7.5.1.2 *Desirable*

a) Level-II qualification in RI, UT, PT, VT, MT in accordance with IS 13805/SNT – TC-1A and DT; or

b) Experience in working in a reputed laboratory in destructive or non-destructive testing and inspection of weld joints.

7.5.1.3 *Professional Experience*

a) Should have wide theoretical and practical knowledge of different welding process and basic aspects of welding technology as inspector;

b) Should be familiar with practical operation of the following welding processes:
   1) Basic gas welding;
   2) Basic arc welding;
   3) Tungsten inert gas (TIG) welding;
   4) Metal active gas (MAG/CO_2) welding;
   5) Pipe welding (TIG + ARC); and
   6) Gas cutting.

c) Should be familiar with the different welding machines related to above processes;

d) Should have knowledge of drawings and various national and international codes/standards and should have knowledge of different welding symbols being used in fabrication welding;

e) Should have basic idea of gas cutting and brazing process;

f) Should have basic idea of preheat and post weld heat treatment;

g) Should be familiar with different types of weld joints and weld positions;

h) Should be conversant with the chemistry and physical characteristics of different base metals used in welding such as steel, stainless steel and aluminium;

j) Should be familiar with:
   1) Weld joint edge geometry checking;
   2) Weld joint fit up checking; and
   3) Weld joint cleanliness checking.

k) Should be familiar with weld joint inspection:
   1) Before start of welding;
   2) During welding; and
   3) After welding;

m) Should be conversant with dimensional accuracy of completed weldment as:
   1) Desirable fillet weld profile;
   2) Unacceptable fillet weld profile;
   3) Desirable groove weld profile; and
   4) Unacceptable groove weld profile.

n) Should be able to check final weld sizes and length;

p) Should be able to physically check the quality of filler wires and electrodes used in welding;

q) Should be conversant with different types of weld defects that occur during welding;

r) Should have knowledge of different destructive and non-destructive tests to be conducted during welding and defect interpretations namely tensile test, bend test (weld root, weld face and weld side);

s) Should be able to interpret radiography testing, ultrasonic testing, dye penetrant testing, magnetic particle testing reports; and

t) Should have knowledge of WPS and PQR and accordingly carry out certification tests.

7.5.2 *Physical Attributes*

a) The candidates eyesight corrected with glasses should be adequate for meeting the requirements for visual testing and radiographic testing as per code requirements; and

b) He should not have any optical disabilities like colour blindness or night blindness.

8 ELIGIBILITY FOR EXAMINATION

8.1 General

To be eligible for certification, the candidate shall submit a formal application along with documented evidence acceptable to the certification body regarding the minimum education and welding related experience (fabrication or inspection) and proof of vision acuity level.

8.2 Education and Experience

To be eligible for examination, the application shall be accepted by the certifying body after verifying that educational qualifications in combination with experience commensurate to the level of certification applied for as indicated in Table 1 to Table 3.

Table 1 Qualification and Experience Requirement for NWIC — Basic Level
(*Clause* 8.2)

Sl No. (1)	Educational Qualification (2)	Experience (3)
i)	Class VIII	5 years industrial experience out of which 3 years in welding area/inspection/NDT of welds
ii)	Class X (with science and math)/ITI (mechanical)	3 years industrial experience out of which 2 years in welding area/inspection/NDT of welds
iii)	Class XII/IWS/IWIP(B) diploma or any equivalent welding Inspectors course	2 years industrial experience out of which 1 year in welding technology/inspection/NDT of welds
iv)	MSc/BE/IWE/BSc/Diploma in engineering/IWT/IWIP(S) diploma or equivalent welding inspectors course	6 months industrial experience in welding technology/inspection/NDT of welds, desirable but not essential

Table 2 Qualification and Experience Requirement for NWIC — Standard Level
(*Clause* 8.2)

Sl No. (1)	Educational Qualification (2)	Experience (3)
i)	Class VIII	8 years industrial experience out of which 5 years in welding area/inspection/NDT of welds
ii)	Class X (with science and math)/ITI (mechanical)	5 years industrial experience out of which 3 years in welding area/inspection/NDT of welds
iii)	Class XII/IWS/NWICS – B/IWIP(B) diploma or equivalent weldingInspectors course	3 years industrial experience out of which 2 years in welding technology/inspection/NDT of welds
iv)	BSc/Diploma in Engineering/IWT, IWIP (S) diploma	2 years industrial experience in welding technology/inspection/NDT of welds
v)	MSc/BE/IWE	1 year industrial experience in welding technology/inspection/NDT of welds

Table 3 Qualification and Experience Requirement for NWIC — Advanced Level

(*Clause* 8.2)

Sl No. (1)	Educational Qualification (2)	Experience (3)
i)	Class X (with science and math)/ITI (mechanical)	10 years industrial experience out of which 5 years in welding area/inspection/NDT of welds
ii)	IWS/IWIP(S)/Class XII (with science and mathematics)	5 years industrial experience out of which 3 years in welding technology/inspection/NDT of welds
iii)	BSc/Diploma in engineering/IWT	3 years industrial experience out of which 2 years in welding technology/inspection/NDT of welds
iv)	MSc/BE/IWE/IWIP (C)	2 years industrial experience out of which 1 year in welding technology/inspection/NDT of welds

NOTE — For applying in NWIC — Advanced level, the candidate must possess NWIC — Standard level or equivalent certification.

8.3 Vision Requirements — The candidate should also possess the following minimum standard of vision acuity level certified by a registered ophthalmologist/ optometrist/ eye specialist:

a) Near vision — Jaeger J2 or better with correction (not more than 12 months old);

b) Colour vision — As per ISHARAS chart (not more than 12 months old); and

c) Subsequent to certification, the tests of visual acuity shall be carried out annually and be verified by the employer or the responsible agency.

9 QUALIFICATION EXAMINATIONS — CONTENT AND GRADING

9.1 Qualification Examinations

Examinations administered under this standard shall consist of written part and a practical part followed by a viva voice. Details of competence and knowledge requirements to appear in qualifying examination are given in Annex A. The question pattern for both theory and practical is given in Annex B.

9.1.1 *Written Examination Content*

The written examination tests the inspector’s knowledge of welding processes, welding procedures, non-destructive examinations, destructive tests, terms, definitions, symbols, reports, welding metallurgy, related mathematics, safety, quality assurance, and responsibilities. The questions are to be selected, commensurate to the level, from the national certifying body’s collection of basic knowledge questions valid at the date of examination.

9.1.2 *Practical Examination Content*

The practical part shall be of sufficient duration, complexity and scope to adequately verify the candidate’s competence to identify and report welding imperfections.

9.1.3 *Viva Voce*

Each candidate has to undergo a viva voce where his level of understanding on welding inspection in real fabrication situation is adjudged.

9.2 Conduct of Examination

9.2.1 Examinations including both written and practical tests shall be conducted in examination centers approved and monitored by the national certifying body directly.

9.2.2 At the examination, the candidate shall have in his possession a valid proof of identification and an official notification of the examination, which must be shown to the examiner or invigilator on request. Any candidate who does not abide by the examination rules during the course of the examination or who perpetrates or is an accessory to fraudulent conduct will be excluded from further participation.

9.2.3 The written and practical tests should be conducted and supervised by an authorized examiner designated by the national certifying body. The examiner may be assisted by one or more invigilators placed under his responsibility.

9.2.4 The examiner shall mark the written tests completed by the candidate. He shall judge and mark the results of the practical tests according to a procedure which includes at least ten check points. This procedure shall be developed by the national certifying body.

9.2.5 A candidate for a practical examination may use his own apparatus. The examiner should investigate the reliability of the test apparatus made available to the candidate, and unreliable apparatus should be replaced as well as any apparatus that may be rendered unserviceable during the course of the examination. Any item of apparatus brought by a candidate that is unreliable or rendered unserviceable during the examination should be replaced by the candidate/course organizer.

9.3 Grading

To be certified, the candidate shall score at least 65 percent each in written, practical and viva voce tests. Weightage of written, practical and viva voce tests will be 40, 40 and 20 respectively and a candidate has to secure minimum 70 percent in weighted average to be declared as Pass.

9.4 Re-examination

9.4.1 *Failed Candidates*

If a candidate fails to secure the qualifying marks as indicated above, he will get two more chances to reappear and clear it within next 2 years from the date of appearing in first exam. Based on the marks obtained and self-assessment, he/she is free to decide in which part(s) he/she will reappear and submit re-examination fees accordingly. At the end of each attempt, the candidate will be evaluated, taking the best of the available results in each part, and result communicated. However, after appearing thrice (one regular and two re-exams) if a candidate can't meet the pass criteria, he/she will be declared fail. In that case, he has to repeat the full qualifying examination.

9.4.2 *Unethical Practices*

A candidate failing for reasons of unethical behavior during examination or whose certificate has been annulled by the national certifying body for unethical practices during welding inspection will be debarred for sitting in the examination for 12 months from the date of commencement of the first examination/withdrawal of certificate as the case may be. After the lapse of the period, he/she may apply as a fresh candidate.

9.4.2.1 In case a candidate is caught for the second time for the unethical practices, he/she will permanently debarred from appearing in the certification exam and viva voce conducted through any national certifying body.

10 CERTIFICATION

10.1 Administration

Based on the results of the qualification examination, the national certifying body shall announce the certification and issue certificates and corresponding wallet cards to the successful candidates.

10.2 Certificates and Wallet Cards

Certificates and wallet cards and corresponding wallet cards shall bear:

a) Full name of the certified individual;
b) Date of certification;
c) Date upon which certification expires;
d) Level of certification;
e) A unique identification number;
f) Signature of the certified individual;
g) A photograph of the certified individual;
h) Seal of the national certifying body cancelling the photograph to avoid falsification; and
j) Signature, on the certificate, of a designated representative of the national certifying body.

NOTE — By issuing the certificate and/or the corresponding wallet card, the national certifying body attests to the qualification of the individual but does not give any authority to operate. There may be a special space on both the certificate and the wallet card for the signature of the employer or responsible agency authorizing the holder of the certificate to operate and taking responsibility for test results. This authorization also serves as testimony of activity of the certified individual.

10.3 Validity

The period of validity of the certificate shall be five years from the date of certification indicated on the certificate and/or wallet card. Certification shall be invalid if:

a) The individual becomes physically incapable of performing his duties or a significant interruption takes place in the individual's work within the scope of the certificate; and
b) The individual fails to meet the vision acuity requirements mentioned in **8.3.**

NOTE — A significant interruption means an absence or a change of activity which prevents the certified individual from practicing the duties corresponding to his level for which he is certified, for a continuous period exceeding one year**.** If the criteria for renewal are not met, the individual shall apply for recertification.

10.4 Renewal of Certificate

10.4.1 After the period of validity, certification may be renewed by the national certifying body for an additional period of five years from the date of expiry provided the individual apply for the same in prescribed form and meets the following criteria:

a) Provides evidence of continued satisfactory work activity without significant interruption; and

b) Reaffirmation of the ‘Code of Conduct’ as prescribed in **6**.

10.4.2 Application for renewal can be made 6 months before to 6 months after the expiry of validity of original certificate.

10.4.3 Renewal will be made effective from the expiry of validity of original certificate.

10.5 Annulment of Qualification

Annulment of qualification to the candidates shall be considered by the national certifyingbody based on the following criteria:

a) Effective period expired for more than 6 months with no application made for qualification continuation;
b) Certificate holder is seized with a serious disorder either mental or physical;
c) A serious fault has been committed by the certificate holder in his/her qualification related work at the opinion of the national certifying body after reviewing evidence of unethical behavior; and
d) Certificate holder has injured the national certifying body’s reputation or conducted against the purpose of the national certifying body.

10.6 Re-Certification

10.6.1 Re-certification is required after one renewal or 10 years whichever is less. The candidate has to apply for the same in prescribed form. This is required after one renewal that is 10 years after original certification or if the certificate becomes invalid due to any reasons like significant interruption, loss of vision acuity, suspension of certificate due to established unethical practices etc. The holder is required to apply to national certifying body by using prescribed form. He/she may also apply for up-gradation of his/her level also during re-certification. Re-certification may involve written test, practical test and viva voce to be decided by national certifying body based on the evidence of continued satisfactory work activity without significant interruption provided by the candidate in the prescribed form; and

a) Reaffirmation of the ‘Code of Ethics’ as prescribed in the NCB quality manual.

10.6.2 Application for re-certification can be made 6 months before to 6 months after the expiry of validity of renewal certificate.

10.6.3 Re-certification will be made effective from the expiry of validity of renewal certificate.

11 FILES

The national certifying body bodies shall maintain the followings either in hard copy form or ‘Read Only’ digitized (electronic) form:

a) An updated list of all certified individuals classified according to level; and
b) Files containing following papers for each individual who have appeared in the certifying examination.
    1) Application forms;
    2) Examination documents, including questionnaires, answers, description of specimens, records, results of test and grade sheets;
    3) Renewal documents, including evidence of physical condition and continuous activity; and
    4) Reasons and penalty for any withdrawal of certification.

NOTE — Files shall be kept under suitable conditions of safety and confidentiality for at least 2 years after validity of certification has lapsed.

ANNEX A
(*Clause* 3.1.14, 4.2 and 9.1)

WELDING INSPECTOR'S KNOWLEDGE AND COMPETENCY REQUIREMENTS

Sl No. (1)	**Subjects** (2)	**Basic Level** (3)	**Std. Level** (4)	**Adv. Level** (5)
i)	*Role and responsibilities of a welding inspector*			
a)	Preparation and reviewing of controlling documents *Example:* Quality assurance plan (QAP), inspection and test plan(ITP)			X
b)	Review, comment and witnessing of welding procedureand performance qualification		X	X
c)	Verification of calibration of equipment and instruments	X	X	X
d)	Witnessing of NDT inspection activities	X	X	X
e)	Verification of all stage inspection activities duringfabrication	X	X	X
f)	Review of NDT inspection reports and activities		X	X
g)	Verification of NDE and welder’s qualification andcertification records		X	X
h)	Interacting with other departments to ensure fabricated components			X
ii)	*Welding inspectors check list*			
a)	Inspection documents and reports to be prepared reviewed and approved by the welding inspector during various stage of fabrication, in line with approved QAP/ ITP such as liquid penetrant test (LPT) report, raw material inspection report, WPS, PQR, WPQ, pneumatic test report etc.		X	X
iii)	*Quality assurance of welds*			
a)	Elements of quality management System (QMS) anddefinition	X	X	X
b)	Quality requirements for fusion welding of metallic materials as per IS 15326 (all parts)		X	X
c)	Quality assurance plan – Preparation and review		X	X
iv)	*Raw materials control and traceability and welding consumables*			
a)	Relevant product forms, for example plate, pipe, forgings and castings and their relevant ASTM standards for carbon steel (CS), stainless steel (SS), Al and Ni alloys.	X	X	X
b)	MSTP (Material sampling and test plan)	X	X	X
c)	Welding consumables selection and Testing	X	X	X
d)	Material traceability mechanisms	X	X	X
e)	Material storage — PMI (Portable material identification)	X	X	X
v)	*Metallurgy and weldability of steels*			

Sl No. (1)	Subjects (2)	Basic Level (3)	Std. Level (4)	Adv. Level (5)
a)	Phases in steel, iron-carbon (Fe–C) and continuous cooling transformation (CCT) diagrams	X	X	X
b)	Hardenability and weldability of steels	X	X	X
c)	Carbon — Manganese steels and concept of carbonequivalence (C.E)		X	X
d)	Low alloy steels for low temperature, high temperatureand high tensile service and their weldability			X
e)	Austenitic, ferritic, martensitic and duplex stainless steels and their weldability			X
vi)	*Metallurgy and weldability of non-ferrous metals andalloys*			
a)	Aluminium and Al alloys			X
b)	Nickel and Ni alloys			X
vii)	*Welding and cutting processes*			
a)	Oxy-fuel, plasma and laser cutting processes	X	X	X
b)	Water — jet and abrasive cutting		X	X
c)	Submerged metal Arc welding (SMAW), gas metal arc welding (GMAW), flux-cored arc welding (FCAW), gas tungsten arc welding (GTAW) and submerged arc welding (SAW) processes	X	X	
d)	Resistance welding processes	X	X	X
e)	Arc welding power sources — Transformer, generator,thyristor and invertor	X	X	X
f)	Selection of power sources, AC / DC importance ofpolarity	X	X	X
g)	Advanced welding and Brazing processes		X	X
h)	Introduction to welding automation		X	X
viii)	*Dissimilar welding, repair welding and PWHT*			
a)	Problems in dissimilar welding		X	X
b)	Selection of consumables in dissimilar welding	X	X	X
c)	PWHT — Temperature, soaking time, heating and cooling rate, uniformity of temperature		X	X
d)	Calibration of furnace, thermo-couples and recorders		X	X
e)	Stress relieving and solution annealing		X	X
f)	Surfacing and Repair welding — preparation of work piece for repair, WPS for repair.		X	X
ix)	Weld defects including distortion in welds			
a)	Classification of weld defects	X	X	X
b)	Process related and metallurgy related defects	X	X	X
c)	Causes and remedies		X	X
d)	Distortion and residual stress control during design and during and after fabrication		X	X

Sl No. (1)	Subjects (2)	Basic Level (3)	Std. Level (4)	Adv. Level (5)
x)	Quality levels for welds and Weld Quality Standards			
a)	Classification and definition of weld defects as per IS 10793 (Part 1)	X	X	X
b)	Quality levels for Arc welded joints in steel as per ISO 5817 Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections	X	X	X
c)	Relevant API 1104 welding of pipelines and related facilities standard for welding of pipe line and related facilities and structural steel welding code in compliance with AWS D 1.1 structural steel welding code	X	X	X
xi)	Welding joints, symbols and positions			
a)	Weld joints and welding symbols IS 813 (all Parts) and AWS D 1.1 structural steel welding code	X	X	X
b)	Welding positions as per AWS D 1.1 structural steel Welding code and ISO 6947 welding and allied processes — welding positions	X	X	X
xii)	Codes and standards			
a)	Need for codes and standards	X	X	X
b)	Difference between code, standard, specification and procedure	X	X	X
c)	Welding Codes — ASME BPVC section IX welding, brazing and fusing qualification, ISO 15609 (all parts) Specification and qualification of welding procedures for metallic materials — welding procedure specification, ISO 15614 (all parts) Specification and qualification of welding procedures for metallic materials — welding procedure test, IS 7310 (all parts) and Indian Boiler Regulation (IBR) 608 and 609	X	X	X
xiii)	Welding qualification — procedure and performance			
a)	Consumables qualification		X	X
b)	Welding procedure specification		X	X
c)	Essential, non-essential and special essential variables		X	X
d)	Formats — WPS, PQR and WPQ		X	X
e)	Qualification ranges		X	X
f)	Destructive and non-destructive testing of samples.		X	X
xiv)	Metrology			
a)	Nomenclature of butt and fillet welds	X	X	X
b)	Measurement of butt and fillet welds	X	X	X
c)	Weld inspection tools — Weld inspection gauges, fillet gauges	X	X	X
d)	Techniques for measurement of distortion	X	X	X
xv)	Introduction to NDT of Welds			
a)	What is NDT and need for NDT	X	X	X
b)	Classification of NDT techniques	X	X	X
c)	Different NDT modalities and applications	X	X	X

Sl No. (1)	Subjects (2)	Basic Level (3)	Std. Level (4)	Adv. Level (5)
xvi)	Visual Inspection (VI) Theory			
a)	Basic visual inspection	X	X	X
b)	Visual inspection aids	X	X	X
c)	VI report format	X	X	X
d)	Codes and standards for Visual inspection	X	X	X
xvii)	Liquid penetrant test (LPT) and Magnetic particle test (MPT) Theory			
a)	Basic and principles of LPT and MPT		X	X
b)	Equipment and classification		X	X
c)	Report formats		X	X
d)	Limitations and advantages		X	X
e)	Sensitivity		X	X
f)	Codes and standards		X	X
xviii)	RT theory			
a)	Basics and principles		X	X
b)	Equipment and sources		X	X
c)	Film		X	X
d)	Radiographic techniques		X	X
e)	Radiographic quality — Image quality indicator (IQI) and density		X	X
f)	Advances in radiography — Digital radiography (DR), computed radiology (CR) and micro focal		X	X
g)	Codes and standards		X	X
h)	Advantages and limitations		X	X
xix)	RT film interpretation			
a)	Viewing radiographic films with different defects			X
b)	identification of different defects			X
c)	Demonstration of density			X
d)	Selection of IQI			X
e)	Artefacts			X
xx)	UT theory			
a)	Basics and principles		X	X
b)	Equipment, transducers and couplant		X	X
c)	Normal and angle beam inspection		X	X
d)	Factors affecting probability of detection (POD) – Beam skewing		X	X
e)	Sizing of discontinuities		X	X
f)	Advantages and limitations		X	X
g)	Codes and standards		X	X

Sl No. (1)	**Subjects** (2)	**Basic Level** (3)	**Std. Level** (4)	**Adv. Level** (5)
h)	UT report formats		X	X
xxi)	Destructive testing of welds			
a)	Tensile testing — Longitudinal and transverse		X	X
b)	Bend tests — Root, face and side		X	X
c)	Impact testing — Room temp and low temp		X	X
d)	Fillet Test — Macro and Fracture		X	X
e)	Relevantstandards — Location, orientation and acceptance criteria		X	X
xxii)	Hazards and safety in welding			
a)	Hazards in welding and cutting	X	X	X
b)	Electrical and arc related hazards	X	X	X
c)	Gas and gas cylinder and pipeline related hazards	X	X	X
d)	Personal protective equipment (PPEs)	X	X	X
e)	Shading of viewing glasses including auto-darkening helmets	X	X	X
f)	Ventilation	X	X	X
g)	Safety standards in welding in compliance with ANSI Z49.1 Safety in welding, cutting, and allied processes	X	X	X
xxviii)	Recommended training hours (including practical, demo of welding processes, RT and destructive testing and visit to fabrication unit)	96 h	8 h	48 h

ANNEX B

(*Clause* 4.2 and 9.1)

WELDING INSPECTOR'S EXAMINATION

Sl No.	*Tests*	*Basic Level*	*Std. Level*	*Adv. Level*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
A	*Theory test*	X	X	X
1)	Theory question papers to be objective type with four (4) possible answers			
2)	For basic and standard level 50 questions to have (i) right answer.			
3)	For advanced level 40 questions to have one right answer and 10 questions to have 2 right answers			
4)	Total 50 questions x 2 marks each = 100 marks	100	100	100
5)	Pass marks	65	65	65
B	*Practical tests*			
1)	Plate and Pipe Butt/fillet welds metrology — To size the important weld geometry parameters	X		
2)	Macro examination of — Plate/pipe/fillet and butt welds — To detect discontinuities and size the same	X	X	
3)	LPT and MPT of welds — To detect and size open to surface discontinuities either by carrying out LPT/MPT of weld coupons.		X	
4)	WPS and PQR — To review and correct mistakes		X	X
5)	Study and interpretation of a weld drawing			X
6)	Radiographic interpretation — To interpret the Discontinuities and evaluate the same with given acceptance criteria for carbon and stainless steels			XX
7)	Marks	100	100	100
8)	Pass marks	65	65	65
C	*Viva voce test*	X	X	X
1)	To be conducted during or after practical			
2)	Marks	100	100	100
3)	Pass marks	65	65	65
D	*Overall weightage*			
i)	Theory 40 Percent			
ii)	Practical 40 Percent			
iii)	Viva voce 20 Percent			

NOTE — To obtain the certificate, a candidate is to secure minimum 65 percent marks in all the sections individually and 70 percent marks in weighted average of all the three sections (A, B and C) mentioned above.

ANNEX C

(*Clause* 3.2)

ABBREVIATION

a) CWIA — Certified welding inspector-advance level

b) CWIB — Certified welding inspector-basic level

c) CWIS — Certified welding inspector-standard level

d) DT — Destructive testing

e) ET — Eddy current testing

f) ITP — Inspection and test plan

g) IWE — International welding engineer

h) IWIP — International welding inspection personnel

j) IWS — International welding specialist

k) IWT — International welding technologist

m) LT — Leak testing

n) MT — Magnetic particle testing

p) NDT — Non-destructive testing

q) NWIC — National welding inspectors certification scheme

r) PMI — Positive material identification

s) PQR — Procedure qualification record

t) PT — Liquid penetrant testing

u) PWHT — Post weld heat treatment

w) QAP — Quality assurance plan

y) RT — Radiographic testing

z) WPQR — Welding procedure qualification record

aa) WPS — Welding procedure specification

bb) UT — Ultrasonic testing

cc) VT — Visual testing

ANNEX D

(*Clause* 2)

IS No.	*Title*
IS 813	Welding and allied processes:
(Part 1) : 2018/ISO 2553 : 2013	Symbolic representation on drawings — Welded joints (*second revision*)
(Part 2) : 2018/ISO 4063 : 2009	Nomenclature of processes and reference numbers (*second revision*)
IS 7310	Qualification testing of welders — Fusion welding:
(Part 1) : 2019/ISO 9606-1 : 2012	Steels (*first revision*)
(Part 2) : 2019/ISO 9606-2 : 2004	Aluminium and aluminium alloys (*first revision*)
(Part 3) : 2019/ISO 9606-3 : 1999	Copper and copper alloys (*first revision*)
(Part 4) : 2019/ISO 9606-4 : 1999	Nickel and nickel alloys (*first revision*)
(Part 5) : 2019/ISO 9606-5 : 2000	Titanium and titanium alloys, zirconium and zirconium alloys (*first revision*)
IS 10793 (Part 1) : 2018/ISO 6520 : 2007	Welding and allied processes — Classification of geometric imperfections in metallic materials: Part 1 Fusion welding (*first revision*)
IS 15326	Quality requirements for fusion welding of metallic materials:
(Part 1) : 2018/ISO 3834-1 : 2005	Criteria for the selection of the appropriate level of quality requirements (*first revision*)
(Part 2) : 2022/ISO 3834-2 : 2021	Comprehensive quality requirements (*second revision*)
(Part 3) : 2022/ISO 3834-3 : 2021	Standard quality requirements (*second revision*)
(Part 4) : 2022/ISO 3834-4 : 2021	Elementary quality requirements (*second revision*)
(Part 5) : 2019/ISO 3834-4 : 2015	Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2, ISO 3834-3 or ISO 3834-4 (*first revision*)
IS/ISO/IEC 17024 : 2012	Conformity assessment — General requirements for bodies operating certification of persons (*first revision*)

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Welding General and its Applications Sectional Committee, MTD 11

Organization	*Representative(s)*
Indira Gandhi Centre for Atomic Research, Kalpakkam	Dr Shaju K. Albert **(*Chairperson*)** Shri M. Krisnamoorthy
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Asian Industries, Mumbai	Shri Rajeev Khanna
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This Indian Standard has been developed from Doc No.: MTD 11 (18754).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi